

# CAMPUS NEWS

## New institutes focus University's research strengths

The University of Wollongong is establishing research institutes in areas of major strengths that will draw together across the campus research activities with a common theme.

The first group of institutes to be established were launched at a function on 30 June by the Chief Scientist, Professor Michael Pitman.

Interest in the launch by community and industry leaders and enthusiasm around campus was such that the function had to be relocated to a larger venue in the Keira View Building.

The multidisciplinary structure of the institutes is held by many to be the way forward for research in a university environment.

The following three institutes were launched on 30 June. Plans are well underway for the launch of further institutes in the near future.

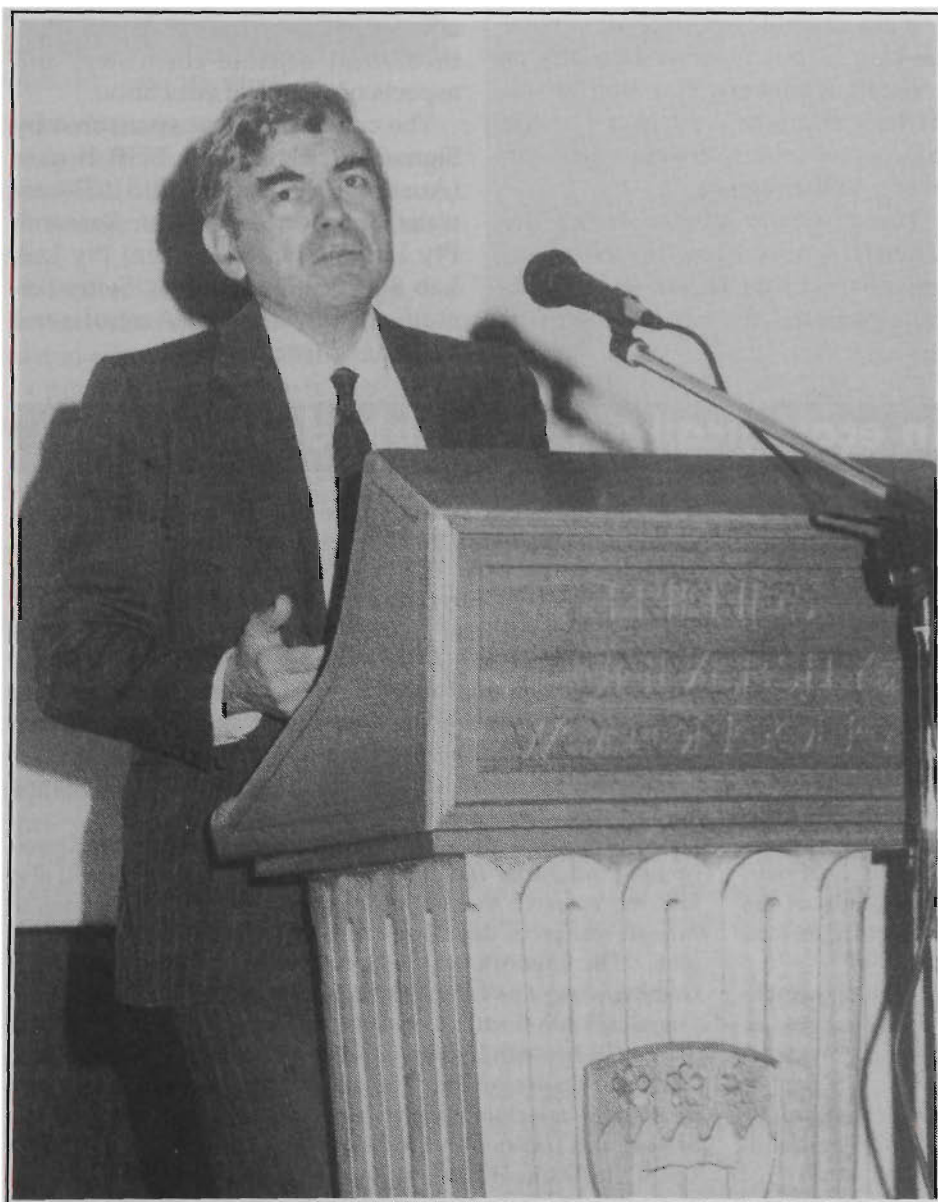
### **The Environment Research Institute (ERI) – Director, Professor John Morrison**

For more than 10 years the University of Wollongong has been carrying out teaching, research and consultancy activities with an emphasis on understanding and management of the world around us and has gained a reputation for innovative teaching and quality research on environmental issues.

The ERI has been established to enhance this activity and to extend the very successful policy of encouraging researchers to work collaboratively to facilitate greater efficiency in the use of resources.

Some of the current research activities are:

- climate change impacts on coastal processes;
- assessment of national drinking water quality standards;
- research on composition of bushfire gases;
- utilisation and management of waste materials;
- mine site investigation and rehabilitation;
- legal and fiscal policy instruments



*Chief Scientist, Professor Michael Pitman, launching the first group of institutes*

*Continued page three*

## Apprentice bowls them overseas

Carpentry and Joinery Apprentice, Brad Hampson, has been selected to represent Australia in the world FIQ Youth Championships of tenpin bowls in Mexico in August.

He has previously represented Australia in Guam, Hong Kong and New Zealand winning several gold medals. Brad is a recent addition to the staff of Buildings and Grounds.

## Review of Department of Philosophy

In accordance with the University's review procedures for academic units, the Vice-Chancellor has initiated a review of the Department of Philosophy.

The review will take place in September 1994.

Submissions to the Review Panel are invited from the campus community. Submissions, which will be treated as confidential, should reach Peter Wood, Academic and Student Services, no later than 31 July.

## Important note for students

Students enrolled in undergraduate courses are required to complete the Library Skills Component of the University's Computer Literacy Pro-

gramme during their first year of study.

This applies to all undergraduate students, including those enrolled in computing subjects.

Students can satisfy the requirement either by completing a short written test or attending an Online Catalogue class.

Catalogue classes are scheduled for the first two weeks of Spring Session (18-29 July). Times are advertised in the Library foyer. Evening classes will be available at 5.30pm on 25 and 27 July. Inquiries: Information Desk (ext. 3548).

## Directory of Asia-Pacific expertise

The Centre for Multicultural Studies has published an inventory of expertise which documents the wide range of work relevant to the Asia-Pacific Region being carried out across the faculties at the University of Wollongong.

It is a valuable resource for anyone seeking to put together research or consultancy teams, planning to undertake some activity in a specific country or looking for comments on events in the region.

The directory demonstrates the University's excellent record of involvement in the region and significant potential for developments in the area.

## Organic Chemistry conference

The first RACI Division of Organic Chemistry conference was held at the University of Wollongong from 3-8 July.

More than 300 participants from Australia and overseas attended.

Plenary lecturers were: Associate Professor M. Banwell (Australia), Dr M. Brimble (New Zealand), Professor M.N. Paddon-Row (Australia), Dr S.E. Thomas (UK), Professor Dr G. Boche (Germany), Professor G. Solladie (France), Dr B. Maryanoff (USA), Professor D.L. Boger (USA), Professor V. Reutrakul (Thailand), and Associate Professor D. Ridley (Australia).

The winner of the Organic Chemistry Medal for excellence in organic chemical research, Professor L. Mander (ANU), also gave a plenary lecture.

The areas of contemporary interest covered included organic synthesis, bio-active compounds, natural products, structure-property relationships, theoretical organic chemistry, and aspects of chemical education.

The conference was sponsored by Sigma Aldrich Pty Ltd, BHP, Bruker (Australia) Pty Ltd, CIG Ltd, ICI Australia, Johnson & Johnson Research Pty Ltd, Varian (Australia) Pty Ltd, Lab Supply (Unanderra), Selby Scientific, Thomas Nelson Australia and National Australia Bank.

## Measuring research in ecologically-sustainable development

A team based at the Centre for Research Policy (CRP) is undertaking a four-month study that will make an important contribution to the goal of ecologically-sustainable development (ESD).

The team, including associate researchers from the University's Department of Science and Technology Studies and the CSIRO, has been contracted by the Australian Research Council (ARC) to investigate the nature and level of research relevant to ecologically-sustainable development funded under ARC research programs.

This work will be an important part of the implementation of the National Strategy for ESD, and will also feed into ESD-related activities in the Asia-Pacific region and into an international forum on sustainable development in October this year.

This will be the first Australian system-wide study of the extent to which government-funded research is oriented toward achieving ecologically-sustainable development.

Knowledge about the level and nature of research relevant to ESD is an important first step in developing policies geared to meeting the broader objective of ESD and in suggesting areas where further research effort will be important.

However, this project will go further and set up a classificatory system for monitoring and evaluating the level of 'ESD-ness' in future research funding.

Apart from providing a picture of how much money and effort in ARC-funded research is relevant to ESD, the output

from the CRP study will be useful beyond ARC research programs and have utility in other research funding and performing agencies as well. This research also will link with two components of the international activities of the CRP.

As the regional focal point for the UNESCO-based Science and Technology Policy Asian Network (STEPAN), the CRP has been invited to present a regional perspective on indicators for ecologically-sustainable development at an international conference on ecological economics in October.

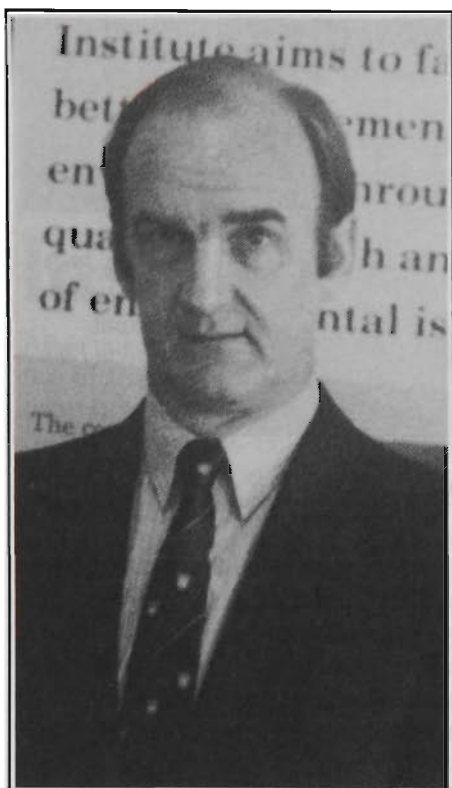
The team will discuss their findings as a model for integrating ESD indicators and R&D indicators.

As the national office for the APEC Human Resources Development Industrial Technologies Network, the centre will also link the research to the development of future directions in human resources development policy in the Asia-Pacific Region. The network will be involved in the development of training programs for industrial technologists where environmental studies form the core element.

The CRP research team consists of Professor Stephen Hill, Associate Professor Tim Turpin and Mr Adrian Deville, and includes as associate researchers senior lecturer, Department of Science and Technology Studies, Dr Sharon Beder, and from the CSIRO Institute of Natural Resources and Wildlife, Manager, Terrestrial Projects, Dr Trevor Redhead, and Manager, Policy and Planning, Dr Andrew Pik.

# Institutes focus research strengths

From page one



*Professor John Morrison*

for biodiversity conservation;

- genetic and evolutionary consequences of different breeding systems;
- energy use in land freight transport;
- dust collection system design;
- interactive multimedia environmental education materials;
- policy issues relating to maritime zone management;
- assessment of community perceptions on environmental issues.

## **The Institute for Molecular Recognition (IMR) – Director, Professor Leon Kane-Maguire**

An exciting initiative that focuses on understanding the full spectrum of molecular interactions from small to large macromolecules and their applications in industry and medicine.

The institute provides a bridge between the disciplines of Chemistry, Biology, Biomedical and Materials Science.

The ability of small and large molecules to recognise and interact with each other lies at the heart of all chemical and biological activity, and has major implications in science and medicine.

For example, recognition plays a crucial role in processes such as pro-

tein synthesis, enzyme catalysis, DNA replication, the immune response, molecular transport and drug action.

Research will focus on the following areas of fundamental importance and of benefit to industry, especially in the pharmaceutical and biomedical areas:

- intelligent biomaterials;
- controlled release of drugs;
- receptor recognition;
- protein structure and function.



*Professor Leon Kane-Maguire*

## **The Institute for Telecommunications Research (TITR) – Director, Professor Hugh Bradlow**

The telecommunications industry is undergoing a dramatic transition.

The changes are driven by the increasingly important role of information in society and the global economy, as well as changes in technology.

In order to keep up with the accelerating pace of development, the industry is undergoing significant restructuring through government deregulation and the emergence of new participants.

These factors lead to an expectation that by the end of the decade we shall see dramatically different telecommunications services and new ways of providing them.

Major trends involve increasingly mobile communications which in-

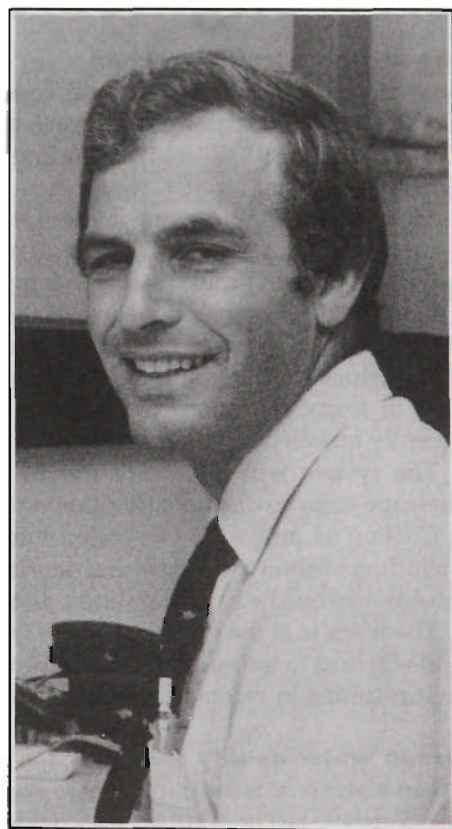
clude many forms of media such as speech, video, data and image.

The discontinuity represented by these changes provides an opportunity for Australia to become a significant participant in the new industries that will emerge in order to support the new environment.

TITR is focused on providing the technological and human infrastructure that will enable Australia to capitalise on this change.

The major groups involved in the Institute are:

- The Switched Networks Research Centre – A Telecom Centre of Expertise;
- Telecommunications Software Research Centre – also funded by Telecom;
- Computer and Communications Security Research Group;
- Wireless Technology Group – supported by Canon and Nokia;
- Neural Networks Research Group – funded by the international telecommunications organisation, SITA;
- Speech Processing Research Group;
- Applied Statistics Research Group;
- applications of telecommunications;
- multimedia research activities.



*Professor Hugh Bradlow*





*Professor Christine Ewan (centre) presents the Frameworks packages to Pauline Mitchell (Lake Heights PS) and Stan Warren, PhD student and Principal, Nareena Hills PS.*

## Another step forward for Frameworks

Teachers will be able to continually evaluate not only children's progress but their own performance thanks to a new assessment and evaluation module of Frameworks, developed in the Faculty of Education by Dr Brian Cambourne, Dr Jan Turbill, Andrea Butler and Gail Langton.

This intensive staff development program aims to challenge teachers' beliefs and practices with respect to their teaching of literacy.

The assessment and evaluation module unpacks the knowledge, skills, understandings and values they need

to control the outcomes standards of the new NSW English syllabus.

Frameworks has received international acclaim, especially in the USA where more than 1000 teachers from 20 states have been trained and it has been successfully trialled in both NSW and American schools.

The program has also been adopted in Papua New Guinea and Canada and negotiations are under way with Saudi Arabia and Mexico.

Both Frameworks and the new module package have been accredited by the NSW Department of School

Education, and 300 teachers in NSW and Victorian schools already have used the program.

The University of Wollongong also provides academic credit to successful facilitators in the Australian program.

The module was launched by Pro-Vice Chancellor (Academic), Professor Christine Ewan.

Managing Director, Illawarra Technology Corporation (ITC), Jim Langridge, spoke about the history of the Frameworks project and ITC's role in its continuing growth both in Australia and overseas.

## Civil engineering research helps community

### **Fog lifts on a traffic problem**

New structures appearing at Bulli Tops on the F6 Southern Expressway are the subject of research by a PhD candidate in the Department of Civil and Mining Engineering, Mr Graham Brisbane.

Motorways show a worrying incidence of multi-vehicle accidents in poor weather, adding dramatically to community concern about traffic safety in foggy conditions.

Curiously, for conventional roads the indications are that the presence of fog may reduce the fatality rate.

To reduce accidents and improve vehicle operator behaviour in foggy conditions the effect of a driver aid system recently installed on the expressway is being studied.

The system will ultimately use 24 'intelligent' variable message signs to display information to vehicle operators.

Costing \$4 million, it can collect information on hazards including visibility, fog type and density, rainfall, as well as speeds and headway ('tailgating') distances used.

The work is at the forefront of this type of traffic research and will lead to techniques for modification of driver behaviour resulting in increased safety for road travellers.

### **Urban water quality studied**

Clean water is an issue important to everyone, whether from the domestic tap or in urban waterways.

The effect of urban development on run-off water may

*Two research projects undertaken in the Department of Civil and Mining Engineering show the community nature of Civil Engineering. Head of the Department, Professor R.N. Singh said: 'Civil Engineering by name and by nature is closely connected with community interests'. He said that was reflected in the following items.*

cause severe degradation of creeks and rivers and bring about community opposition to future development activity.

Postgraduate research based on data obtained from surveys of an urban water drainage basin in the Cronulla-Sutherland area is well advanced.

At West Dapto three of the Department's 56 PhD students are surveying a catchment in its rural state, with the aim of monitoring water quality during the construction of a large housing estate.

Thanks to the combined efforts of the developer, Wollongong City Council and other interested parties, automatic sampling stations have been set up in the catchment to continuously record run-off water quality and flow.

Water samples are collected automatically and analysed at the Department to monitor any changes in water quality as development proceeds, providing a unique opportunity to study the effectiveness of the strategies used for protecting the catchment.

# Resources

University of Wollongong

Environment Research Institute Newsletter No. 4, July 1994

## Institute moves into action in 1994

After spending much of 1993 getting the ERI Strategic Plan and management structure prepared and accepted by the University, 1994 has seen significant progress in initiating activities.

Following acceptance of the Strategic Plan at the end of 1993, a Senior Fellow, John Hibberd, was recruited to work with members on the development of research project applications and the establishment of consultancy teams.

John has considerable experience in this type of activity and his initial efforts led to the award of two recent research contracts from DEST for studies on health implications of climate change.

One project is coordinated by Professor Dennis Calvert (Environmental Health Unit) on Disease Surveillance Networks for early warning of changes in climate related disease incidence, and the other led by Professor Rob Whelan (Australian Flora and Fauna Program), investigating Climate Change and Pollen Allergens.

### From the Director's desk

In addition, a number of grant applications are being prepared on 'Greenhouse' strategies (Technology and Environmental Strategies group), remnant vegetation on roadsides (Australian Flora and Fauna Program), coastal zone management in ASEAN countries (Environmental Science).

Discussions are in progress with a number of universities and state land management agencies for the development of a Graduate Diploma in Forest Resource Management.

This would build upon existing AIDAB overseas training courses which already involve ERI members.

In addition to carrying on productive research within their research groups, ERI members are continuing work on the public consultation and assessment of the 1994 National Drinking Water Guidelines for NHMRC; members are also involved in work for AIDAB on the rehabilitation of mined-

out areas on Nauru, development for the Illawarra Catchment Management Committee of guidelines for the preparation of urban catchment management plans, and preparation of management plans for NSW south coast lakes.

The Centre for Maritime Policy hosted in May two very successful workshops in Canberra and Sydney on security and management issues relating to coastal zone management.

The Centre, together with the Centre for Natural Resources Law and Policy and the Department of History and Politics will be offering, in August, a series of short courses on Law of the Sea, Exclusive Economic Zone Management and Maritime Enforcement.

As noted elsewhere in this issue, a successful seminar series is continuing and the small grants scheme initiated at the end of 1993 has been extended into 1994.

Interactions with industry and government agencies have been further enhanced in 1994 partly through student projects and partly through direct contacts initiated by the ERI.

Projects involving collaboration with such organisations now exceed 50.

Congratulations to Associate Professor Philip Laird for the award of the Australian Institute of Engineers National Paper Prize (National Committee on Transport), to Associate Professor Barry Harper and members of the Environmental Education group for the award of the ATOM prize for the "Investigating Lake Iluka" interactive CD-ROM package, to David Griffith (Environmental Chemistry) for the award of \$25,000 from the National Greenhouse Gas Inventory Committee for studies on greenhouse gas emissions, and to the Water Engineering and Geomechanics Research Program for the award of a DITARD grant to promote international research collaboration with the Public Works Institute, Japan under the Bilateral Science and Technology Collaboration Program.

### 1993 ERI Small Grant to Institute members to assist in research

Phil Broadbridge and Tim Marchant were grateful recipients of a grant of \$1500 to produce new realistic exact solutions of the time-dependent unsaturated flow equation.

We negotiated with a Melbourne supplier for a site licence for MAPLE on a SUN Sparc workstation, at the price of \$1500, considerably lower than other quotes.

MAPLE is a powerful computer algebra package that can carry out symbolic calculations in calculus and algebra.

Over the summer session, the Department employed recent graduate Jacqui Kearton to construct a computer algebra program which takes solutions of the linear diffusion equation as inputs and transforms them, through a complicated parametric transformation, to solutions of the realistic nonlinear unsaturated flow equation.

This program is carrying out its function but the solutions that we have obtained so far are not believable. The problem is about to be rectified by PhD student Maureen Edwards who has found that we inadvertently fed a singularity into the input. Broadbridge found also that the input leads to more than one branch in the output solution. There is no real barrier to further progress and we expect to publish our results by the end of the year.

### ERI SEMINARS

Seminars have been presented over recent months jointly hosted by the Institute and various Departments.

#### **The economic approach to environmental issues**

*David Bernauer and Walter Moore from the Economic Assessment and Monitoring Division of the NSW Environmental Protection Authority*

Late in 1993, David Bernauer and Walter Moore from the Economic Assessment and Monitoring Division of the NSW Environmental Protection Authority visited the University of Wollongong.

At a talk presented to the Environmental Research Institute, they outlined the EPA's approach to economic assessment of environmental issues.

Pressures for a more consistent integration of economic and environmental assessments began with the Brundtland World Conservation Strategy, 1980.

Similar themes can be detected in the recent Rio de Janeiro UN Conference on Environment and Development and the Australian Inter governmental Agreement on the Environment.

This approach is reflected in the NSW Legislation establishing the EPA which replaced the SPCC in 1992.

Other pressures which are moulding the Division's work program are the Report on Indicators of environmental conditions in NSW, the NSW Treasury's Economic Appraisal Guidelines and the NSW regulations regarding Impact Assessed Statements.

These regulations require that environmental factors be taken into account when assessing major projects.

However, any serious inclusion of environmental factors in economic analysis is limited by the lack of suitable tools by which environmental impacts can be measured in economic terms.

Thus one of the major tasks of the Division in its first year of operation has been to derive a methodology by which environmental factors can be given some positive price or value in these studies.

They are producing a data base of materials on environmental monetary values and measurement and estimates of valuations for environmental effects which can be used in such studies.

The data base currently includes around 700 studies.

Other projects have included a benefit/cost study of lead concentrates in petrol and its effect on children's health, case studies relating to the use of tradeable economic permits in relation to river pollution and smog, and a study on the use of load base licensing to control discharges while providing incentives to reduce omissions below statutory requirements.

The results of these studies are not yet available.

The Division is also required to undertake five yearly assessments of all environmental regulations.

A recent analysis of the regulations affecting radiation from medical equipment concluded that the health benefits from the controls exceeded the costs.

All such regulations will be continually subjected to rigorous assessments.

The visitors concluded that economic investments were

unlikely to replace regulation as the main means of environmental control in the foreseeable future.

The EPA was also increasing its regulative powers.

Half the divisions staff were involved in scientific data collection and assessment and monitoring duties.

Good scientific data was essential before an economic approach can be considered.

#### **Atmospheric CFC slowdown: the result of the Montreal Protocol**

*Dr Jim Elkins is currently chief of the Nitrous Oxide and Halocarbons Division, of the National Oceanographic and Atmospheric Administration's Climate Monitoring and Diagnostic Laboratory in Boulder, Colorado.*

Dr Elkins is recognised as a world authority in the area of atmospheric research and has been actively measuring the effects of CFCs and halons on the atmosphere for more than a decade.

Dr Elkin's recent trip to Australia was a side trip from New Zealand, where he is involved in a major measurement campaign looking at the Antarctic "ozone hole" and related processes.

He was in Australia primarily to inspect the facilities and perform measurements at the Cape Grim Baseline Air Pollution Station atmospheric research centre in Tasmania.

However, we were fortunate that he chose to add the University of Wollongong to his itinerary in order to have discussions with members of the ERI.

Dr Elkins began his talk by providing a brief account of the reasons why CFC's were chosen to replace ammonia as refrigerants, and for their widespread use in other areas such as aerosol cans and the manufacture of insulating foams in the plastics industry.

He then discussed how the "ozone hole" over the Antarctic was discovered in 1985, and the chemistry behind its creation.

Recognition of the existence of the ozone hole led to a major meeting of government and scientific bodies in 1986 which put forward a series of guidelines (Montreal protocol) for the phasing out of the use of CFCs and their replacement by safer alternatives.

The Montreal meeting was followed by similar meetings in London (1990) and Copenhagen (1992), which accelerated the phase out of CFCs.

While this was certainly to be commended, Dr Elkins pointed out that due to the complex nature of events in the atmosphere, we cannot be totally sure that some of the materials introduced to replace CFCs would not at a later stage be shown to creating new problems, hence the need for continued vigilance.

Dr Elkin's concluded by presenting some of the results of his own research performed at 7 sites spread across the globe, showing us that the rate of increase in the mixing ratios of the major CFCs were slowing.

This welcome sign of adherence to the international protocols has still not halted the increase, but calculations



indicate that this might happen as early as 1996.

The next couple of years, he said, should provide clear evidence of whether the guidelines for the phasing out of CFC's put forward by the Montreal protocol, has started to have a major effect.

## A model for salt transport in the mangrove root zone

*Seminar presented on 31 March, by Dr John Knight, CSIRO Centre for Environmental Mechanics.*

Mangroves grow on saturated soils subject to regular tidal inundation by saline sea water.

Mangrove roots take up water and leave behind most of the salt, which diffuses back up to the soil surface against the net flow of water to the root zone, and so the salt concentration in the root zone rises until the diffusive and advective salt flows are equal and opposite, and a steady state is reached.

John described a model due to Passioura, Ball and himself, for salt transport in the mangrove root zone, which assumes that there is an upper limit to the soil salinity at which the roots can take up water, and that below this value the water uptake is proportional to the difference between the local soil salinity and the assumed upper limit.

Recently Knight and C.J. van Duijn, a visitor from Delft, generalised this model to allow the root water uptake function to vary with depth, and to depend on a general power of the salinity difference.

The time evolution of the soil salt concentration is described by an advection-diffusion-reaction equation with linear diffusion, nonlinear nonlocal advection, and a nonlinear nonhomogeneous reaction term.

They found a steady state, a travelling wave and another special case analytical solution for this equation, which they used as a guide in finding numerical solutions for the general equation.

They used a "mean transition time" defined by Prof. Alex McNabb (1975), another recent visitor to Wollongong, to study the characteristic times for the various

processes involved, in order to gain insight into the relative effects of diffusion, advection and reaction.

The results show that mangroves can greatly increase the soil salinity in and below the root zone, even many metres below the roots.

This may happen over a time scale of around 40 years.

This seminar generated considerable interest from the geomorphologists present, as it is commonly believed that the high salt concentration observed in deep soils near mangroves has a more ancient geomorphological origin.

When challenged, Dr Knight couldn't explain the salinity of soils measured by Wollongong geomorphologists in flat areas removed horizontally from mangroves.

This raises new challenges for both the mathematical modellers and the geomorphologists.

Perhaps both are right and there are more than one contributing mechanisms.

Dr Knight will visit again to confer with Phil Broadbridge and Wayne Read, a visitor on study leave from James Cook University of North Queensland.

Dr Read found a series method for obtaining exact solutions to Laplace's equation in arbitrary geometries.

This has direct applications to steady saturated flow in soils.

Usual classical methods of separation of variables apply only to simple geometries such as rectangular, cylindrical and spherical systems. However, Read found a way to extend this procedure to arbitrary geometries.

Phil Broadbridge pointed out that the steady equations for unsaturated flow can be transformed to linear convection-diffusion equations and that the same analytical techniques should be extendible to these.

At the moment, we are implementing the procedure to solve a practical unsaturated flow problem of slow recharge into an aquifer.

At high recharge rates, a water table will form, and we would need to determine the position of the free surface for the water table.

This is a tougher problem that we can still solve by matching fluxes between the saturated and unsaturated zones, in which two different types of elliptic partial differential equation apply.

*Working Paper Series 1, Environment Research Institute, March 1994*

## Energy use in Australian land freight

### ABSTRACT

In this paper, an update is given of a report (Laird and Adorni-Braccesi, 1993, Land Freight Transport Energy Evaluation, Energy Research and Development Corporation, Canberra).

Australia's land freight task of approximately 184 billion tonne km (btkm) in 1990-91 comprised 67 btkm for articulated trucks, 28 btkm for rigid trucks, 52 btkm for government rail freight and 37 btkm for non-government rail freight.

The 1990-91 road freight tasks used

### ERI PUBLICATION

about 151 Petajoules (PJ) of primary energy (3400 million litres (ML) of diesel and 243 ML of other fuel), whilst rail freight used about 28 PJ of primary energy (some 550 ML of diesel fuel, and 620 Gigawatt hours of electricity).

Many Australian rail and road freight operations demonstrate "world best practice" in energy efficiency.

These include the iron ore railways of the Pilbara region of Western Aus-

tralia, and the electric coal trains of Central Queensland.

World class examples of road freight may be found in Northern Territory road trains and many selected articulated truck operations in Eastern Australia.

On the other hand, many land freight operations in Australia demonstrate considerable room for improvement in energy efficiency.

In road freight, there is scope for some articulated truck operators to reduce their use of diesel fuel with the

*Continued page four*

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aid of on-board vehicle monitors.

A five percent increase in average energy efficiency of articulated trucks would save about 100 million litres of diesel a year.

In inter-city freight, the largest scope for improvement would result from upgrading the existing Brisbane-Sydney - Melbourne mainline railway by a series of deviations and minor track upgrading to ease ruling grades and tight radius curves so as to increase rail's efficiency and competitiveness.

This could result in diesel savings

about 125 million litres a year by the year 1999-2000. Rail electrification of Sydney-Melbourne and the main Hunter Valley coal rail lines could offer further diesel savings of about 100 million litres per year.

At present, Queensland's progress in improving the efficiency and competitiveness of rail freight is somewhat ahead of that of New South Wales.

It remains to be seen if this gap will be narrowed by the year 2000, and what will be the role of the National Transport Planning Task Force in improving the efficiency of land

freight transport in Australia.

**UPDATE:** Apelbaum Consulting Group Pty Ltd (1994, The Australian Transport Task and Primary Energy Consumed; The 1990-91 Compendium, Cth Dept of Primary Industries and Energy, Canberra) notes respective government and non-government rail freight primary energy efficiencies of 2.21 and 7.79 net tonne km per MJ.

**AUTHOR:** P.G. Laird, Department of Mathematics, University of Wollongong 2522. PHONE 042 213 421 FAX 042 214 845.

## CONFERENCES

### South Pacific countries tackle waste issues

ERI Director, John Morrison, recently chaired a meeting of experts to review a Regional Pollution and Waste Management Program for the South Pacific under the aegis of the South Pacific Regional Environment Programme (SPREP).

The meeting was held at SPREP Headquarters in Apia and involved 10 participants from seven countries.

SPREP is an intergovernmental agency established to coordinate environmental technical assistance, training, education and cooperation involving 22 countries in the Pacific and a number of associated metropolitan countries including Australia.

The work program covers the whole spectrum of environmental issues including work on international and regional treaties and conventions.

The Apia meeting was to provide technical review on a

draft project document to address the issues of waste management and pollution prevention and control.

Both land-based and shipping-related pollution problems are included and a major focus is also on the protection of freshwater resources.

This project will follow on from and significantly expand work completed in the SPREP POL Marine Pollution Assessment and Control project coordinated by Professor Morrison from 1988-92.

The revised project will be presented to a Regional Meeting of Government Technical Officers in Tonga in August and if accepted will go to the SPREP Annual Meeting in September for final approval and submission to aid donors for financial support.

Anyone wanting further information on this should contact John Morrison, phone (042) 214 134.

## MEMBERS/GROUPS RESEARCH

### A Brief Report to ERI on the Project 'Wave Refraction and Diffraction in Coastal Regions'

An efficient numerical model for simulating the combined refraction and diffraction of water waves propagating in coastal regions [1] has now been extended in modelling short waves.

With only the boundaries of a computational domain being discretised and some internal collocation points being distributed as required by the DRBEM (The Dual Reciprocity Boundary Element Method), Zhu [2, 3] compared some of his preliminary results with some other previously published numerical and experimental model results and found that the model can not only offer excellent accuracy and efficiency in modelling long waves as demonstrated in [1], it can also be used very efficiently in a short wave modelling exercise with a high accu-

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*Songping Zhu  
Department of Mathematics,  
University of Wollongong,  
Wollongong, NSW 2522,*

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racy as well.

Since modelling short waves (waves with their wavelength to depth ratio being less than approximately 20) has always been a challenging problem for coastal engineers, Zhu has contributed significantly to this area through his recent research and the relevant publications [1-3].

However, such a contribution could not have been made without the partial support from the Environmental Research Institute at the University of Wollongong, which was gratefully

acknowledged in the publication [3].

#### Relevant Publications:

1. Zhu, S. A New DRBEM Model for Wave Refraction and Diffraction, *Engineering Analysis with Boundary Elements*, 1993, Vol.12, No.4, 261-274.

2. Zhu, S. and Zhang, Y. Combined Refraction and Diffraction of Short Waves Using The Dual Reciprocity Boundary Element Method, *J. Communications on Boundary Elements* (accepted).

3. Zhu, S. Modelling The Combined Refraction and Diffraction of Short Waves With The Dual Reciprocity Boundary Element Method, *Proceedings of the International Symposium Waves-Physical and Numerical Modelling*, Vancouver, Canada, August 1994 (accepted).



*The following projects are currently being undertaken by the Environmental Health Unit:*

## Port Kembla lead study

This study was launched on 7 June. The aim is to investigate the blood lead levels in children one to six years of age in the Port Kembla, Warrawong and Cringila area.

All children living in the area will be contacted with a door-to-door visit.

They will be invited to come to the Port Kembla Hospital where a blood sample will be taken.

The sample will be analysed for lead level and indicators of anaemia.

Parents will be asked to fill in a questionnaire concerning residential and medical history of the child and occu-

pational and medical history (as far as relevant) of the parents.

A tooth lead study will be undertaken also as this would allow monitoring of lead levels without having to take blood samples.

The individual results should be available this year with the evaluation of the distribution of the lead levels in relation to exposure and confounding variables available at the end of 1995.

A further evaluation of the exposure to lead and other metals will be considered.

## The Hunter and Illawarra Study on Airways and Air Pollution (HISAAP)

The Illawarra Public Health Unit together with the University of Wollongong and the Hunter Area Public Health Unit together with the Newcastle Toxicology and Respiratory Unit are conducting a study on the occurrence of episodes of asthma in relation to ambient air pollution.

Several sites in the Newcastle area and four sites in the Illawarra

(Kemblawarra, Kembla Grange, Gwynneville and Albion Park) have been selected for this study.

The first phase consisted of a questionnaire sent to all children aged eight to 10 years of selected schools in the area.

Those who answered according to preset criteria indicating an increased risk of asthma were asked to partici-

pate in Phase 2. Phase 2 Part 1 is being conducted.

Half of the children previously identified were asked to participate in a six-months study filling out diaries and doing lung function tests twice daily.

The second part will take place in the second part of the year and other children will be invited to join.

## Environmental Science students at the University of Wollongong contributing to environmental research

This is the second year that students in their fourth year of the Bachelor of Environmental Science Degree at the University of Wollongong have been placed within external organisations to complete professional work experience in the form of an honours research project/report (ENVI403).

The environmental research projects are put forward by the host organisation and are in one of the four areas of degree specialisation (Earth Sciences, Land Resources, Life Sciences and Pollution Control).

The student is co-supervised by a member from the host organisation and a University academic from the department most relevant to the topic. This program has been very successful in developing links between the University and other research organisations, government bodies and industry.

In this way the students, the host organisations and the University have gained a broader understanding of the range and the interrelationship of environmental issues requiring study in this region. The scope of the projects for 1994 can be seen in the table starting on this page.

Although the projects were intended to be situated in the Illawarra region, the Environmental Science Unit has found that the program has also raised interest beyond the local area.

Some projects are centred around Sydney, regional NSW, Melbourne and various places in the Northern Territory.

Student numbers have quadrupled since last year with 41 students enrolled in ENVI403 in 1994.

Planning strategies implemented in the last few years seem to indicate that student numbers will level off at about 25 per year in the next few years.

### ENVI403 RESEARCH REPORTS 1994

Student Name (Specialisation*)	Project Title	Host Organisation
Matthew Imber (ES)	Environmental Baseline Study: Pride of Frogmore	CRA Exploration Pty Limited
Mark Murrie (ES)	Productive Capacity of Deep Water Lake Sediments: Northern Lake Illawarra	NSW Public Works
Marrack Payne (ES)	Productive Capacity of Deep Water Lake Sediments: Southern Lake Illawarra	NSW Public Works
Conrad Smith (ES)	Environmental Baseline Study: Frogmore	CRA Exploration Pty Limited
Jennifer Atchison (LR)	Geoarchaeological Analysis of Jinnium Site, NT	Australian Museum
David Clarkson (LR)	Inputs to the Inner Harbour: Hydrological Study	BHP Steel Slab and Plate Products Division

## Resources

Maria Coleman (LR)	Inputs to the Inner Harbour: Sediment Transport Characteristics	BHP Steel Slab and Plate Products Division
Katherine Day (LR)	Past, Present and Potential Land Use for Red Point	Water Board, Illawarra
Heidi Fenech (LR)	Identification and assessment of Estuarine Wetlands and their Status within Sutherland Shire	Sutherland Shire Council
Felicity Hargraves (LR)	Decline of Seagrass in the Shoalhaven and Crookhaven Estuaries	NSW Fisheries
Rhys Jenkins (LR)	A Profile of Potentially Contaminated Land within a Local Government Area	Sutherland Shire Council
Melanie Johnson (LR)	Potential for Natural Regeneration at Red Point	Water Board, Illawarra
Lara Odell (LR)	Identification and Assessment of Riparian Wetlands and their Status within Sutherland Shire	Sutherland Shire Council
Damian Paynter (LR)	Comparison of Acid Sulphate Soils in Wollongong and Shoalhaven Districts	NSW Conservation and Land Management
Debra Rae (LR)	State of Environment Reporting Process - an Appraisal for Kiama Council	Kiama Municipal Council
Kim Riordan (LR)	Environmental Audit of the Water Board's Wollongong Sewage Treatment Works	EPA
Jeanette Schwarz (LR)	Image Analysis of Vegetation Patterns-Alligator Rivers Region Mining Operations	Ansto
Mark Stratford (LR)	Image Analysis of vegetation Patterns- Rum Jungle Mining Operations	Ansto
Chris Togher (LR)	Historic Mapping of Escarpment Vegetation	NSW NPWS
Marina Van Vliet (LR)	Contaminated Waste Management Audit of the Illawarra Area Health Service at Illawarra Regional Hospitals: Cytotoxic Waste and Sharps and Related Waste	Illawarra Area Health Service
Russell Wilson (LR)	Contaminated Waste Management Audit of the Illawarra Area Health Service at Illawarra Regional Hospitals: Radioactive Waste and Contaminated Waste other than Sharps	Illawarra Area Health Service
Sally Anderson (LR)	An Assessment of Habitat Corridors for Kiama Municipal Council QEM	Kiama Municipal Council
Lyall Bogie (LS)	Fuel Accumulation Rates for Catchment Vegetation	Water Board, Catchment Services
Suzanne Crosthwaite (LS)	A Comparative Study of Koala populations at Mt Keira and Nattai Reserves	NSW NPWS
Carla Ganassin (LS)	Value of Seagrass Wracks as a Habitat and Foodsource: Implications for Management	NSW Fisheries
Michelle Jallard (LS)	Study of Intertidal Rocky Foreshore in Relation to Discharged Sewage Effluent	Water Board, Illawarra
Elvira Lanham (LS)	Bird Populations in Urban Forest Fragments: A Historical Study	State Forests of NSW
Paul Mooney (LS)	Fire and Swamp Community Interactions	Water Board Catchment Services
Tara Patel (LS)	Review of Data and Further Investigation of the Effect of the Mittagong and/or the Berrima Bypass Construction on the Wombat Population	RTA
Murray Schofield (LS)	Bird Populations in Urban Forest Fragments: A Field Study	State Forests of NSW
Andrew Holloway (PC)	Inorganic Arsenic Speciation by Ion Chromatography	Ansto
Mark Bergild (PC)	Analysis of the Metals Cu, Ni & Cr in Shellfish as an Indication of Contamination from Sewage Treatment Plants	Wollongong City Council
Oswaldo Perez (PC)	Chemical Investigations	Abbot Australasia Pty Ltd
Tanya Branson (PC)	Trends in CFC Emissions from Melbourne	CSIRO Division of Atmospheric Research
Michelle Bruce (PC)	Tin Mill Sludge as a Soil Conditioner	BHP Steel Slab and Plate Products Division
Caroline Griffiths (PC)	Study of Water Quality within the Macquarie Rivulet Catchment	Shellharbour Municipal Council
Kim Marshall (PC)	Analysis of the Metals Zn, Cd & Pb in Shellfish as an indication of Contamination from Sewage Treatment Plants	Wollongong City Council
Perry Rennex (PC)	A Review of all Available Data Relating to Water Quality of the Waterways within the City of Wollongong	Wollongong City Council
Gregory Watkins (PC)	Primary Clarifier Effectiveness	Australian Paper
Jennifer Watson (PC)	A Waste Stream Management System for Grinding Coolants	BHP Steel Slab and Plate Products Division
David Blackmore (PC)	Environmental Impact of Vanadium and its Treatment in an Industrial Waste Stream	Research & Technology Centre, BHP Sheet & Coil Products Div

\* ES-Earth Sciences, LR-Land Resources, LS-Life Sciences, PC-Pollution Control

## General

23-24 July: The Campus Alumni Bookshop monthly book sale from 1-5pm at Campus East, Fairy Meadow. The stock of used books covers science, engineering, social sciences, arts, music, education, fiction, non-fiction, young readers stories and classics.

15-19 August: SRC Blue Stocking Week.

28 August: University Open Day.

30 August-3 September: Union Week.

4 September: Graham Park, Shoalhaven, Open Day.

The Illawarra Committee for Overseas Students (ICOS) upcoming events: July 23 and August 6: Snowy Mountains one-day trip \$25 (coach only).

Department of Business Systems seminars: Friday 22 July, Mr Wei Dai, Telecom Research Laboratories, Melbourne. Integration of expert systems techniques into conventional software environments. 12.30pm, Kemira Room 3, University Union. Friday 29 July, Dr Stephen Little, Department of Business Systems, University of Wollongong. Emerging forms of organisation in a networked world. 12.30pm, 67.101 Keira View Building.

Dr John D'Arcy May, 1994 Ethel Hayton Fellow in Religious, Spiritual and Contemplative Studies, presents a

## What's On

seminar program to accompany his lecture series. The program, called 'The Ethics of Multiculturalism: Conflict and Peace in an Inter-religious Ethos', will run on Tuesdays from 4.30-6.30pm in Tutorial Room, lvl 3, Bld 11.203. The dates are: 26 July, Sectarianism: Northern Ireland; 2 August, Communalism: India and Sri Lanka; 9 August, Fundamentalism: A Pan-Religious Phenomenon; 16 August, Pluralism: Australia in the Asia-Pacific Region; 23 August, Engaged Buddhism: Thailand in Transition; 30 August, Postmodernism: The Decline of the West? Enquiries: David Muscio, phone (042) 21 3073.

Cell and Molecular evening seminar series run by the Department of Biological Sciences. July 25: Prof Kevin Lafferty (Director, John Curtin School of Medical Research, ANU) Held at 7.30pm in Building 35, Room 105. Enquiries: Phone (042) 213 013, Fax (042) 214 135.

### City of Wollongong Symphony Orchestra Concerts

13 August: Past Eisteddfod Winners,

Petra Davis (violin), Heather Lee, (soprano). Conductor: JWD. University Singers. Conyngham 'Matilda' (for BC's 50th b'day); Bruch Violin Concerto No1, Arias from 'Don Pasquale', 'Capulets and Montagues', 'Don Giovanni', Dvorak Slavonic Dances.

All concerts at IMB Theatre, IPAC, on Saturdays at 8pm. Adults \$20, concession \$17, family of four \$64, student rush \$10.

### The Art of Lunch

A series of one-hour performances in the Music Auditorium (University Building 24.G01) on Thursdays at 12.30 during session. Admission: Free

### Long Gallery

Until 24 July: NAIDOC Show, curator Trish Woods. Kath Woof.

29 July-21 Aug: TAFE/Artist Books Exhibition.

25 Aug-18 Sept: Turkish Exhibition, student/community.

22 Sept-12 Oct: Postgraduate Show, Leonard Smith, Catherine Kay.

16 Oct-6 Nov: Bronzes, Ken Stone, Lynn Brunet.

For further information please contact Elizabeth Jeneid at the Faculty of Creative Arts, phone (042) 21 3048.

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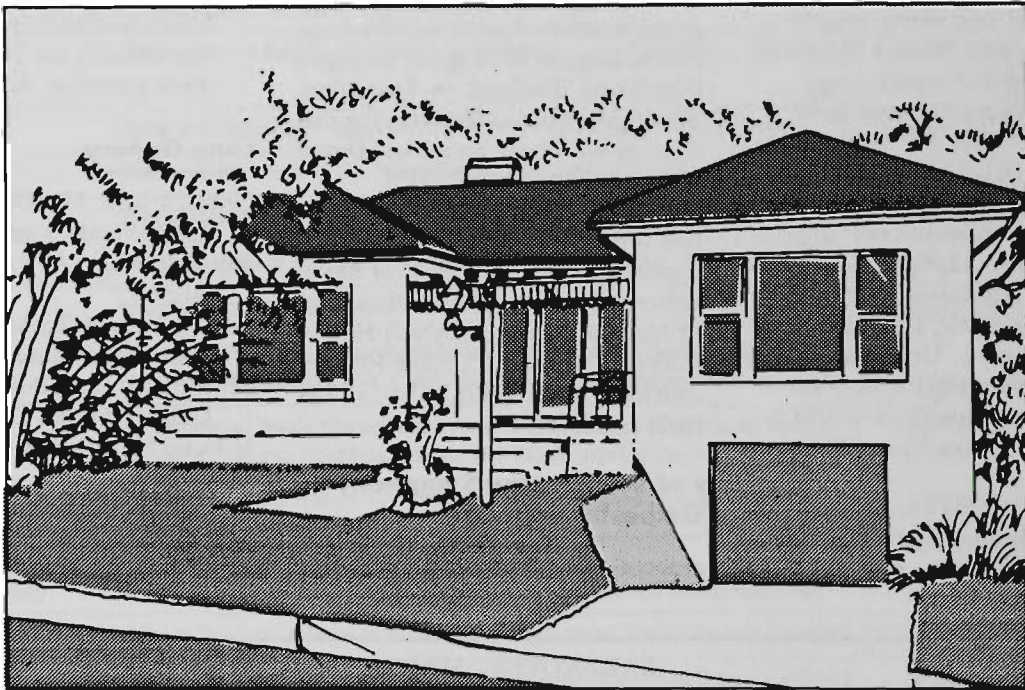
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